REMARKS

Claims 4 and 6 are pending in the present application. Claim 4 is herein amended. Claims 1-3 and 5 are herein cancelled. New claim 6 has been added. No new matter has been entered.

Rejections under 35 USC §112, Second Paragraph

Claim 5 was rejected under 35 U.S.C. 112, second paragraph, as being indefinite.

Claim 5 has been cancelled and the rejection has become moot.

Rejections under 35 USC §102/103

Claims 1 to 5 were rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over each of Daisuke et al. ("Daisuke 303", JP 01-117303) and Satoru et al. ("Satoru 048", JP 62-074048).

Claims 1-3, and 5 have been cancelled, and the rejection of these claims has become moot.

Claim 4 has been amended as shown above. The amendment is supported in the original specification, for example, at pages 7, 13, 14, 17-21, especially at pages19-21.

The present invention is a method for producing a rare earth-iron-boron based magnet which has a particular structure in which a crystal grain boundary layer is enriched in the element M by reaction with the Nd rich phase.

In the conventional method of improving the coercive force of Nd-Fe-B based magnet focused on the miniaturization and homogenization of the crystalline structure. The present inventors took a completely different approach and discovered that the coercive force of Nd-Fe-B based magnet is significantly improved by concentrated diffusion of the element M into the grain boundary area.

The diffusion can be carried out either by heating the Nd-Fe-B based sintered body after coating with the element M or by heating Nd-Fe-B based sintered body while the element M is being coated.

The present invention has made it possible to improve the coercive force of Nd-Fe-B based magnet beyond the limit of the conventional method, which is a significant break through of the technology.

The present invention is also remarkable in that the diffusion of element M is concentrated in the grain boundary area. This makes it possible to improve the coercive force of Nd-Fe-B based magnet with a minimal amount of the element M, which is scarce and expensive material. Therefore, the present invention also has industrial significance.

Daisuke et al. describes as follows:

> A **layer having a higher intrinsic coercive force than that inside a magnet** is provided by diffusing at least one of Tb, Dy, Al, and Ga, near the surface of a R(rare earth element)-Fe-B based (R is at least one kind of La, Ce, Pr, Nd, Pm, Sm, E; u, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, and Y)

> magnet. La, Ce and Y are available as R used for a R-Fe-B based magnet. Each can be used singly or jointly mixed. For an intrinsic coercive force iHc material formed near the surface of a magnet, Tb, Dy, Al or Ga is available, and this can be used singly or mixed. One example of diffusing the above materials is to perform heat treatment after performing sputtering for these materials as negative pole target materials. This method enables materials to be diffused not only on the surface of a magnet, but to the inward thereof. As a result, a layer having a coercive force higher than that inside the magnet can be formed.

(Daisuke et al., abstract). Thus, Daisuke et al. forms a layer having a coercive force higher than that inside the magnet. The higher coercive force is limited to the surface layer. The coersive force of the magnet is not improved.

In contrast, according to the present invention, the coercive force of the magnet is improved three-dimensionally.

Satoru et al. describes as follows:

> The sintered magnet body composed mainly of, by atom, 12-20% R (one or more elements among Nd, Pr, Dy, Ho and Tb or further one or more elements among La, Ce, Sm, Gd, Er, Du, Tm, Yb, Lu and Y), 4-20% B and 65-81% Fe and having a main phase consisting of tetragonal crystal is formed. This magnet body is cut off and subjected to grinding work and then the thin-film layer of R' (one or more elements among Nd, Pr, Dy, Ho and Tb) is allowed to adhere to the surface to be ground by a sputtering method, etc. Subsequently, heat treatment is applied to the above material in vacuum or in an inert atmosphere at 400-900°C for 5min-3hr, by which **a layer deteriorated by working is formed into a reformed layer**. In this way, high-efficiency permanent magnet material of ≤ about 1.0mm thick can be obtained.

(Satoru et al., abstract, “12W20% R” “4W20% B” “65W81% Fe” “400W900°C” are typographical errors and corrected here to “12-20% R” “4-20% B” “65-81% Fe” “400-900°C”). Thus, Satoru et al. discloses a mending of the surface of the magnet deteriorated by working.

Thus, according to Satoru et al., the improvement is limited to the surface deteriorated by working.

Thus, Daisuke et al. and Satoru et al. do not teach or suggest "heating the magnet at 500-1000°C so as to diffuse and penetrate the element M into the magnet from the surface thereof so as to form a crystal grain boundary layer enriched in the element M by reaction with the Nd rich phase disposed between main crystals." Also, nothing in Daisuke et al. and Satoru et al. indicates that the magnet satisfies the following (A) to (D): "(A) $Hcj \geq 1+ 0.2 \times M$ and $0.05 \leq M \leq 10$, where Hcj is coercive force in MA/m, and M is concentration of the element M in mass % in a whole magnet, (B) $Br \geq 1.68 - 0.17 \times Hcj$, (C) the element M ~~reaches at least a depth~~ reacting with the Nd rich phase distributes in a range of 10-1000μm from exposed surfaces, and (D) wherein concentration of the element M increases as the crystal grain boundary layer approaches to surface of the magnet, and the concentration of element M is 50 mass % or more at 10 μm from the surface."

For at least these reasons, claim 4 patentably distinguishes over Daisuke et al. and Satoru et al.

<u>Double Patenting Rejection</u>

Claims 1 to 5 were rejected on the ground of nonstatutory obviousness-type double patenting as being obvious over claims 1 to 4 of U.S. Patent No. 7,402,226.

A terminal disclaimer is attached hereto.

Rejections under 35 USC §103(a)

Claims 1 to 5 were rejected under 35 U.S.C. 103(a) as being obvious over the sputtering process recited in the claims of '226 which are encompassed by the instant claims.

The inventors of United Patent No. 7,402,226 are Kenichi Machida, Shunji Suzuki, Eiji Sakaguchi, and Naoyuki Ishigaki. All the inventors of the present application, Kenichi Machida and Shunji Suzuki, are included in the inventors of the '226 patent. Therefore, it is clear that the invention disclosed in U.S. Patent No. 7,402,226 is invented by the present inventors.

New Claims

New claim 6 has been added.

In view of the aforementioned amendments and accompanying remarks, Applicants submit that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

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Enclosure: Terminal Disclaimer to Obviate a Double Patenting Rejection over a “Prior” Patent